
The Chilean *Agallis* and Californian *Tropidocarpum* (Brassicaceae) are Congeneric

Ihsan A. Al-Shehbaz

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166-0299, U.S.A.

Robert A. Price

P.O. Box 8082, Athens, Georgia 30603, U.S.A.

ABSTRACT. *Agallis* is reduced to synonymy of *Tropidocarpum*, and the new combination *T. lanatum* is therefore proposed. The morphological similarities in plant aspect, flowers, and fruit between the two genera are presented, and a key to species of *Tropidocarpum* is given. Disjunction between North and South American congeners of the Brassicaceae is discussed.

Key words: *Agallis*, North-South American disjunctions, *Tropidocarpum*.

The recent discovery of the monotypic *Twisselmannia* (Al-Shehbaz, 1999) prompted comparative and molecular studies on the Californian *Tropidocarpum* Hooker (2 spp.) and Chilean *Agallis* Philippi (monotypic). The results of that study will be published elsewhere.

The monotypic *Twisselmannia* was previously known from two collections from Kings County, California, *LaRue s.n.* (UCR) and *Taylor & Ertter 17098* (MO, UC), but a third collection, *Twisselmann 10447* (CDA), was collected from Kern County on a canal bank at the southern end of Kern National Wildlife Refuge.

Agallis lanata (Barnéoud) Gilg & Muschler ex O. E. Schulz is restricted to central Chile and is known from several old collections (see below), while *Tropidocarpum gracile* Hooker is widespread in northern Baja California and southern California northward through the central valley north of San Francisco (Rollins, 1993a; Wiggins, 1980). By contrast, *T. capparideum* E. L. Greene, which is presumed extinct (Rollins, 1993a), is known from older collections made near Mount Diablo at the northwestern part of San Joaquin Valley.

The similarities between *Agallis*, *Tropidocarpum*, and *Twisselmannia* include annual habit, indumentum of coarse simple trichomes mixed with smaller forked ones, pinnatisect to pinnatifid petiolate leaves, racemes bracteate throughout, yellow flowers occasionally tinged with purple, dilated bases of staminal filaments, angustiseptate fruits, mucic-

laginous seeds, and incumbent cotyledons. *Twisselmannia* is easily separated from the other two by having obdeltoid, 4- to 8-seeded silicles and antrorsely hirsute fruit valves that are tuberculate-rugose, thick leathery to subwoody on the distal halves, and abruptly narrowed to apex. In contrast, *Agallis* and *Tropidocarpum* have linear or oblong to elliptic, 16- to 70-seeded siliques and uniformly leathery, retrorsely hirsute (except when glabrescent) valves with obtuse apices. Except for the valve number, which is two in *Agallis lanata* and four in *T. capparideum*, the other differences separating the two species are quantitative. The increase in valve number is a highly unusual feature in the Brassicaceae, and within *Tropidocarpum* the fruits of *T. gracile* are 2-valved whereas those of *T. capparideum* are 4-valved. The only other documented example is in the unrelated genus *Rorippa* Scopoli (ca. 75 spp.), in which one species, *R. barbareaifolia* (DC.) Kitagawa, has 4- to 6-valved fruits. On the basis of these remarkable morphological similarities between *Agallis* and *Tropidocarpum*, the two genera are herein united.

Tropidocarpum becomes the fifth genus of Brassicaceae with known disjunct distribution in temperate North and South America. *Mancoa* Weddell is represented by seven species in northern Mexico and adjacent Texas and four species in southern Peru, Bolivia, and northern Argentina (Rollins, 1941; Al-Shehbaz, 1990). *Pennellia* Nieuwland includes 11 species, of which eight are distributed from northern Guatemala into Mexico and the southwestern United States (Rollins, 1980, 1993a), one in southern Bolivia and northern Argentina (Al-Shehbaz, 1990), and two were treated by Rollins (1993b) in *Arabis* but now belong to *Pennellia* (Bailey, 2001; Price et al., in press). Other South American species listed by Schulz (1924, 1936) under *Heterothrix* Rydberg or *Pennellia* belong to the poorly defined *Sisymbrium* L. sensu lato (Al-Shehbaz, 1990).

The fourth genus with disjunct distribution is

Lesquerella S. Watson (ca. 100 spp.), which is distributed primarily in the southern and western United States and northern Mexico. One species, *L. arctica* (Wormskiöld & Hornemann) S. Watson, grows in Greenland, Alaska, and the Canadian and Russian arctic and subarctic regions (Rollins & Shaw, 1973; Jurtzev, 1975), while a few species of the *L. mendocina* (Philippi) Kurtz complex are disjunctly restricted to Argentina from Mendoza south into Chubut (Boelcke & Romanczuk, 1984). Finally, *Thlaspi* L. is represented in South America by one native species, the Patagonian *T. magellanicum* Commerson ex Poiret (Boelcke & Romanczuk, 1984), which is quite disjunct from the four to six native North American species that are distributed from northern Mexico and western United States northward into Alaska (Holmgren, 1971; Rollins, 1993a). Detailed aspects for other North and South American disjunctions also present in other plant families are discussed in the classic work of Raven (1963).

Although *Cardamine* L., *Descurainia* Webb & Berthelot, *Draba* L., *Halimolobos* Tausch, *Lepidium* L., and *Rorippa* are represented by indigenous species in both North and South America, their distributions are basically continuous. However, molecular studies on *Draba* show that some of the South American species are most closely related to disjunct relatives in North America (Koch & Al-Shehbaz, in prep.).

Tropidocarpum Hooker, Icon. Pl. t. 43. 1836.
TYPE: *Tropidocarpum gracile* Hooker, Icon. Pl. t. 43. 1836.

Agallis Philippi, Linnaea 33: 12. 1864. Syn. nov. TYPE: *Agallis montana* Philippi, Linnaea 33: 12. 1864 (= *Agallis lanata* (Barnéoud) Gilg & Muschler ex O. E. Schulz, in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 17B: 418. 1936).

For a detailed description of *Tropidocarpum*, see Rollins (1993a).

KEY TO THE SPECIES OF *TROPIDOCARPUM*

- 1a. Fruit narrowly linear, (2.5–)3–6(–7) cm × 1.5–2 mm *T. gracile*
- 1b. Fruit oblong to elliptic, 1–2(–2.5) cm × 3–5 mm.
 - 2a. Fruit valves 4; anthers oblong, 0.4–0.5 mm; fruit 25- to 40-seeded; California *T. capparideum*
 - 2b. Fruit valves 2; anthers ovate, 0.15–0.25 mm; fruit 16- to 26-seeded; Chile *T. lanatum*

Tropidocarpum lanatum (Barnéoud) Al-Shehbaz & R. A. Price, comb. nov. Basionym: *Lepidium lanatum* Barnéoud, in Gay, Fl. Chile 1: 167. 1846. TYPE: Chile. Santiago, C. Gay s.n. (holotype, P; photos, F, US).

Specimens examined. CHILE. **Región IV:** Fray Jorge, Las Papas, ca. 500 m, *Jiles* 720 (S); Ovalle, Bosque Fray Jorge, open meadow, *Sparre* 3029 (S). **Región Metropolitana:** Santiago, *Claude-Joseph* 2232, 2267 (US); Lo Prado, *Claude-Joseph* 2791 (US).

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